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EXAMINER	
LEE, SHUN K	

ART UNIT	PAPER NUMBER
2884	

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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/511,734	PROTIC ET AL.	
	Examiner	Art Unit	
	Shun Lee	2884	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *31 October 2007 and 31 January 2008*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1 and 3-12* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1 and 3-12* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *05 January 2007* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☒ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

National Stage Application

Continued Examination Under 37 CFR 1.114

1. A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submissions filed on 31 October 2007 and 31 January 2008 have been entered.

Claim Rejections - 35 USC § 112

2. The following is a quotation of the first paragraph of 35 U.S.C. 112:

> The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

3. Claim 8 is rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the written description requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention.

Amended dependent claim 8 recites the limitation "wherein the amorphous layer is not doped". Applicant argues that support for this amendment may be found at pg. 6, line 11 to pg. 7, line 10. The specification states (pg. 6, line 11 to pg. 7, line 10) that "Very good results have been achieved with an amorphous layer made of germanium. ... The crystalline region

beneath the amorphous layer then preferably also consists of germanium. ... The amorphous layer is always applied to a semiconductor material. The amorphous layer therefore provides an electrical conductivity, which is substantially smaller than the conductivity of the material disposed beneath the amorphous layer. In one exemplary embodiment for the manufacture of the invention, an amorphous germanium layer is initially applied by sputtering or vapour deposition. ... metallic layer ... is subsequently applied by vapour deposition. ... Grooves are etched in the amorphous germanium-metallic layer to such a depth that they extend at least into the germanium crystal region. ... ". Thus there is no express disclosure in the application as filed that the amorphous layer is not doped. While there is no *in haec verba* requirement, newly added claim limitations must be supported in the specification through express, implicit, or inherent disclosure (MPEP § 2163). Further, the passage cited by applicant as support for the newly added claim limitation also does not appear to contain an implicit or inherent disclosure that the amorphous layer is not doped. Therefore, the newly added claim limitation was not described in the specification as filed.

Claim Rejections - 35 USC § 103

4. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

5. This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were

made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

6. Claims 1 and 3-12 are rejected under 35 U.S.C. 103(a) as being unpatentable over Hamacher *et al.* (Performance of position -sensitive germanium detectors in nuclear reaction experiments, Nuclear Instruments & Methods in Physics Research, Vol. A295, no. 1-2 (October 1990), pp. 128-132) in view of Luke *et al.* (Amorphous Ge bipolar blocking contacts on Ge detectors, IEEE Transactions on Nuclear Science, Vol. 39, no. 4 (August 1992), pp. 590-594).

In regard to claims **1**, **3-5**, **7**, and **8**, Hamacher *et al.* disclose (Fig. 1) a camera with a position-sensitive detector for measuring charged particles comprising a crystalline substrate formed of semiconductor material (*e.g.*, high-purity germanium) and a surface region, the surface region comprising blocking contacts (formed by boron ion implantation) with a structured, metallic layer comprises Al (aluminum) disposed above it, wherein the structure of the metallic layer continues through the blocking contacts and at least partially into the crystalline substrate (see "transferring the structure into the semiconductor material by etching" in Fig. 1). The detector of Hamacher *et al.* lacks that each of the blocking contacts comprise a germanium (or silicon) amorphous layer disposed on the crystalline structure, wherein the amorphous layer is not doped. Luke *et al.* teach (section 1) to apply an undoped germanium amorphous layer (that forms good bipolar blocking contacts) on a p- or n-doped germanium crystalline

semiconductor structure as an equivalent alternative to a boron doped layer. Therefore it would have been obvious to one having ordinary skill in the art at the time of the invention to provide an undoped amorphous germanium layer instead of the boron doped layer for each of the plurality of blocking contacts in the detector of Hamacher *et al.*

In regard to claim **6** which is dependent on claim 1, Hamacher *et al.* also disclose (section 3.1, last paragraph on the right column on pg. 129) that the structure is formed from segments having a mutual spacing of less than 100 μm.

In regard to claim **9** which is dependent on claim 1, Hamacher *et al.* in view of Luke *et al.* is applied as in claim 1.

It is noted that claim 9 recites that the camera is a tomograph or compton camera which appears to be mere statements of purpose or use and does not appear to imply any additional structural limitations of the camera with a position-sensitive detector as recited in claim 1. Applicant is advised that should claim 1 be found allowable, claim 9 will be objected to under 37 CFR 1.75 as being a substantial duplicate thereof. When two claims in an application are duplicates or else are so close in content that they both cover the same thing, despite a slight difference in wording, it is proper after allowing one claim to object to the other as being a substantial duplicate of the allowed claim. See MPEP § 706.03(k).

In regard to claims **10** and **11** which are dependent on claim 6, Hamacher *et al.* also disclose (section 3.1, last paragraph on the right column on pg. 129) that the mutual spacing is less than 100 μm (*e.g.*, less than 20 μm).

In regard to claim **12**, Hamacher *et al.* disclose (Fig. 1) a method of producing a position-sensitive detector for measuring charged particles, comprising: providing a crystalline substrate (*e.g.*, high-purity germanium); forming a blocking layer on the substrate by boron ion implantation; disposing on the blocking layer a metallic layer (*i.e.*, aluminum); removing portions of the metallic layer, the blocking layer and the crystalline substrate such that at least one structured electrode is formed (see "transferring the structure into the semiconductor material by etching" in Fig. 1). The method of Hamacher *et al.* lacks that forming the blocking layer comprises disposing on the substrate an amorphous Germanium layer. Luke *et al.* teach (section 1) to apply a germanium amorphous layer on a p- or n-doped germanium crystalline semiconductor structure, in order to obtain good bipolar blocking contacts. Therefore it would have been obvious to one having ordinary skill in the art at the time of the invention to provide an undoped amorphous germanium layer instead of the boron doped layer in the method of Hamacher *et al.*, in order to obtain good bipolar blocking contacts.

Response to Amendment

7. The declaration under 37 CFR 1.132 filed 31 January 2008 is insufficient to overcome the rejection of claims 1 and 3-12 based upon Hamacher *et al.* in view of Luke *et al.* as set forth in the last Office action because it refers only to the system described in the above referenced application and not to the individual claims of the application. Thus, there is no showing that the objective evidence of nonobviousness is commensurate in scope with the claims. See MPEP § 716.

In view of the foregoing, when all of the evidence is considered, the totality of the rebuttal evidence of nonobviousness fails to outweigh the evidence of obviousness.

Response to Arguments

8. Applicant's arguments filed 31 October 2007 and 31 January 2008 have been fully considered but they are not persuasive.

Applicant argues (third and fourth paragraphs on pg. 3 of remarks filed 31 October 2007) that an undoped amorphous layer deposited prior to metallization was specifically recited since the method does not recite that the layer is subsequently doped, but rather that the metal electrode is "subsequently" applied, whereas the doping step for the Boron doped layer at the opposite side of the detector is specifically recited. Examiner respectfully disagrees. Each claim limitation must be expressly, implicitly, or inherently supported in the originally filed disclosure (MPEP § 2163.05). There does not appear to be an express disclosure that undoped Germanium was deposited. Further, applicant's arguments rest on the unsupported assumption that an additional step is needed to dope an undoped amorphous Germanium layer formed by sputtering or vapor deposition. However, the cited prior art teaches that a doped amorphous Germanium layer is formed using a RF sputterer with a Ge target and a gas mixture of 7% hydrogen in argon (*e.g.*, see section II "CONTACT FABRICATION" of Luke *et al.*). Therefore to one having ordinary skill in the art, a description of a "subsequently" applied metal electrode does not imply or require that an undoped Germanium layer was initially applied by sputtering or vapour deposition.

Applicant argues (last paragraph on pg. 3 to third paragraph on pg. 4 of remarks filed 31 October 2007) that Hamacher *et al.* teach away from modification by stating that the steps shown in Fig. 1 are "essential". Examiner respectfully disagrees. Hamacher *et al.* state (pg. 129) that " ... the n+ contact was produced by Li diffusion instead of a phosphorus implantation ... ". Thus Hamacher *et al.* expressly teach at least one modification of the "essential" steps illustrated in Fig. 1 wherein a Li doped layer is used instead of a P doped layer for each of the plurality of blocking contacts. Further, Luke *et al.* state (pg. 590) that "Semiconductor nuclear radiation detectors are usually operated in a full depletion mode and blocking contacts are required to maintain low leakage currents and high electric fields for charge collection. Blocking contacts on Ge detectors typically consist of n-type contacts formed by lithium diffusion and p-type contacts formed by boron ion implantation ... alternative to the contacts discussed above are amorphous semiconductor contacts ... ". Thus the cited prior art clearly teach an amorphous semiconductor layer as an equivalent alternative to a boron doped layer. An express suggestion to substitute one equivalent component for another renders such substitution obvious (MPEP § 2144.06). Therefore it would have been obvious to one having ordinary skill in the art at the time of the invention to provide an amorphous semiconductor layer instead of the boron doped layer for each of the plurality of blocking contacts in the detector of Hamacher *et al.*

Applicant argues (fourth paragraph on pg. 4 to second paragraph on pg. 5 of remarks filed 31 October 2007) that it is relevant that Hansen *et al.* state that an amorphous Germanium passivation layer is, on balance, a desirable feature, whereas it is not relevant whether Hansen *et al.* says that lack a passivation layer can be tolerated

in certain conditions. Examiner respectfully disagrees. A reference may be relied upon for all that it would have reasonably suggested to one having ordinary skill the art, including nonpreferred embodiments (MPEP § 2123). In this case, Hansen *et al.* state (pg. 247) that " ... Because of the high cost of each detector, very careful handling, storing and mounting can be tolerated and the demand for good passivation is generally relaxed. ... To be truly satisfactory, the surface passivation must be adjustable to produce flat band condition. ... ". Further Fig. 7 of Hansen *et al.* illustrates that for a detector with an a-Ge:H coating on exposed surfaces to obtain the same leakage current as a detector having a "standard" surface treatment, the a-Ge:H coated detector must be cooled to a lower temperature. Thus Hansen *et al.* teach or suggest a-Ge:H coating on exposed surfaces has both advantageous and disadvantageous features. Therefore, the Hansen *et al.* publication would have reasonably suggested to one having ordinary skill the art that detectors can have either a "standard" surface treatment or an a-Ge:H coating on the exposed surfaces of the detector.

Applicant argues (last paragraph on pg. 5 of remarks filed 31 October 2007) that one having ordinary skill the art would not have considered uncovering the grooves while still leaving the amorphous Germanium underneath the metal contacts, because one having ordinary skill the art would have believed that would sacrifice the passivation effect while still causing higher leakage currents at high temperatures. First it should be noted that Hansen *et al.* state (pg. 251) that " ... The detector coating sequence is as follows: ... the detector to be coated is placed Li side down on an indium foil and the boron side is partially covered by a small piece of indium foil ... ". Thus it is clear that the detector coating sequence of

Hansen *et al.* deposits an a-Ge coating on the exposed surfaces between the p+ and n+ contacts (*i.e.*, the detector surfaces not covered by indium foil during the detector coating sequence). The higher leakage current at a given temperatures for "a-Ge:H" (as compared to "CH_3OH") plotted in Fig. 7 of Hansen *et al.* is due to an a-Ge coating on the exposed surfaces between the p+ and n+ contacts. Thus there does not appear to be any experimental results within the Hansen *et al.* publication as to the leakage current when the blocking contacts comprise an a-Ge layer. Therefore the Hansen *et al.* publication does not appear to be relevant when considering whether one having ordinary skill in the art would substitute one equivalent component for another (*i.e.*, an amorphous semiconductor layer instead of the boron doped layer for each of a plurality of blocking contacts). Further in response to applicant's argument, the test for obviousness is not whether the features of a secondary reference may be bodily incorporated into the structure of the primary reference; nor is it that the claimed invention must be expressly suggested in any one or all of the references. Rather, the test is what the combined teachings of the references would have suggested to those of ordinary skill in the art. See *In re Keller*, 642 F.2d 413, 208 USPQ 871 (CCPA 1981). In this case, Hamacher *et al.* teach (see Fig. 1) a plurality of blocking contacts wherein each blocking contact comprises a boron doped layer between an Al layer and a semiconductor material. Further, Luke *et al.* teach (see pg. 590) an amorphous semiconductor layer as an equivalent alternative to a boron doped layer. An express suggestion to substitute one equivalent component for another renders such substitution obvious (MPEP § 2144.06). Therefore it would have been obvious to one

having ordinary skill in the art at the time of the invention to provide an amorphous semiconductor layer instead of the boron doped layer for each of the plurality of blocking contacts in the detector of Hamacher *et al.*

Applicant argues (second paragraph on pg. 6 of remarks filed 31 October 2007) that there is no teaching in the prior art that a device according to claim 1 has been built. First it is noted the instant claims were rejected under 35 U.S.C. 103 and not 35 U.S.C. 102. Therefore, these arguments are not persuasive since the issue is whether the instant claims would be obvious to one having ordinary skill in the art at the time of the invention.

Applicant argues (second and fourth paragraphs on pg. 6 of remarks filed 31 October 2007) that Luke *et al.* teach away from combination with Hamacher *et al.* since Luke *et al.* teach that a passivation layer is advantageous, and do not teach structuring the electrodes to remove the passivation layer. Examiner respectfully disagrees. A reference may be relied upon for all that it would have reasonably suggested to one having ordinary skill the art, including nonpreferred embodiments (MPEP § 2123). In this case, Luke *et al.* teach (see pg. 590) an amorphous semiconductor layer as an equivalent alternative to a boron doped layer. An express suggestion to substitute one equivalent component for another renders such substitution obvious (MPEP § 2144.06). Therefore it would have been obvious to one having ordinary skill in the art at the time of the invention to provide an amorphous semiconductor layer instead of the boron doped layer for each of the plurality of blocking contacts in the detector of Hamacher *et al.*

Applicant argues (second paragraph on pg. 2 to last paragraph on pg. 3 of remarks filed 31 January 2008) that there was no motivation to combine Hamacher *et al.* with Luke *et al.* since there was no motivation to improve the blocking ability of the Hamacher *et al.* Boron doped contact (that already provides an excellent contact) because doing so will not improve the energy resolution. Examiner respectfully disagrees. The combination of familiar elements according to known methods is likely to be obvious when it does no more than yield predictable results (MPEP § 2141). In this case, Luke *et al.* teach (see pg. 590) an amorphous semiconductor layer as an equivalent alternative to a boron doped layer. Therefore it would have been obvious to one having ordinary skill in the art at the time of the invention to provide an amorphous semiconductor layer instead of the boron doped layer for each of the plurality of blocking contacts in the detector of Hamacher *et al.*

Applicant argues (first paragraph on pg. 4 to last paragraph on pg. 5 of remarks filed 31 January 2008) that there is no motivation to combine Hamacher *et al.* with Luke *et al.* at the relevant point in time because a person of ordinary skill in the art would have expected the use of an amorphous Germanium contact to decrease the energy resolution of the device. Examiner respectfully disagrees. First it should be noted that the detectors referred to (on pg. 5 of the instant specification and pg. 889 of Attachment 2) by applicant comprise: an a-Ge blocking contact and an a-Ge coating on exposed surfaces between the blocking contacts. Thus the evidence cited by applicant only support a conclusion that some embodiments of detectors comprising an a-Ge blocking contact and an a-Ge coating on exposed surfaces between the blocking

contacts have an energy resolution that is potentially degraded. The evidence cited by applicant does not support a conclusion that the potential degradation of the energy resolution is due to the a-Ge blocking contacts. On the contrary, Hansen *et al.* teach (see Fig. 7) that there is a higher leakage current at a given temperatures for "a-Ge:H" (as compared to "CH_3OH") due to an a-Ge coating on the exposed surfaces between the p+ and n+ contacts. Moreover even if a decrease in energy resolution is due to a-Ge blocking contacts, other advantages of a-Ge blocking contacts may be more important than energy resolution for a particular application. Further, an express suggestion to substitute one equivalent component for another renders such substitution obvious (MPEP § 2144.06). Therefore it would have been obvious to one having ordinary skill in the art at the time of the invention to provide an amorphous semiconductor layer instead of the boron doped layer for each of the plurality of blocking contacts in the detector of Hamacher *et al.*

Applicant argues (first paragraph on pg. 5 of remarks filed 31 January 2008) that one of ordinary skill in the art would have had no reasonable expectation of success in combining Hamacher *et al.* with Luke *et al.* Examiner respectfully disagrees. Luke *et al.* teach (see pg. 590) an amorphous semiconductor layer as an equivalent alternative to a boron doped layer. Thus Luke *et al.* suggest that the modification would be successful. Therefore it would have been obvious to one having ordinary skill in the art at the time of the invention would have a reasonable expectation of success in providing an amorphous semiconductor layer instead of the boron doped layer for each of the plurality of blocking contacts in the detector of Hamacher *et al.*

Conclusion

9. All claims are drawn to the same invention claimed in the application prior to the entry of the submission under 37 CFR 1.114 and could have been finally rejected on the grounds and art of record in the next Office action if they had been entered in the application prior to entry under 37 CFR 1.114. Accordingly, **THIS ACTION IS MADE FINAL** even though it is a first action after the filing of a request for continued examination and the submission under 37 CFR 1.114. See MPEP § 706.07(b). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

10. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Shun Lee whose telephone number is (571) 272-2439. The examiner can normally be reached on Monday-Thursday.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, David Porta can be reached on (571) 272-2444. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/Constantine Hannaher/
Primary Examiner, Art Unit 2884